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INTERNATIONAL

NOVEMBER 1951

VOLUME 26 • NUMBER 11

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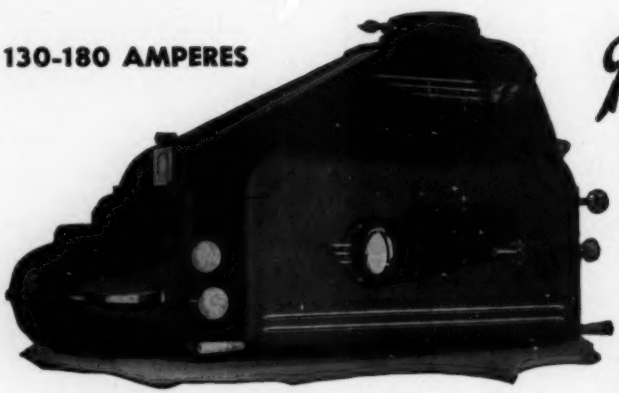

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HENRY B. SELLWOOD, *Editor*

Volume 26 NOVEMBER 1951 *Number* 11

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MONTHLY CHAT

THE constant striving on the part of arclamp manufacturers and projectionists for a higher level of screen brightness is pointed up, although from different avenues of approach, by two articles appearing in this issue: "The Trail of the Elusive Screen Lumen," by Charles Hahn of J. E. McAuley Co., and the report of the SMPTE Screen Brightness Committee.

Mr. Hahn is most emphatic but not dogmatic in his treatise on light, and therefore heat, levels in motion picture projection. Asserting that careful and extensive tests revealed that 16,000 lumens is the most that the film will take without serious damage, Mr. Hahn decries the so-what attitude of those who keep upping the light level without utilizing some means for taking the heat-sting out of the light. His preference is for the heat-absorbing glass filter system, which he holds to be the most efficient means for doing the job with a minimum light loss.

High-velocity air streams, interference coating filters, and water-cooled mechanism setups don't catch the Hahn fancy, and he's quite positive in saying so—and why. Other manufacturers and projectionists hold to different views, and it would be a pity if the Hahn effort did not provoke a forthright expression of those views.

The SMPTE report reveals that a survey of 125 indoor theaters and 18 West Coast studio review rooms showed that about one-half of the indoor theater and two-thirds of the review room projectors produced screen brightness within the American Standard range. The remainder ranged from extremely low to excessively high. *Distribution* of light over theater screens likewise ranged from very uniform to extremely non-uniform. Screen reflectivity varied from values typical of screens in good condition all the way down to a level of 50% deterioration.

Now, it seems to us that there is something radically wrong with an industry which, recently observing its 50th anniversary, permits the existence of such conditions. It would be bad enough in any industry, but in show business where entertainment is merchandised it is unthinkable. Sure, there are many links in the projection chain, and only a single defect along the way can ruin the overall effect produced. Yet uniform distribution of screen light is not too tough a problem to lick; and a screen deterioration of 50% is disgraceful.

The great majority of exhibitors either don't know or don't care about such problems: they're strictly lobby boys. But the great majority of projectionists *do* know and *should* care about such matters. Much could be done by way of corrective action right in the projection room, and we suggest that projectionists start doing those few simple chores right now.

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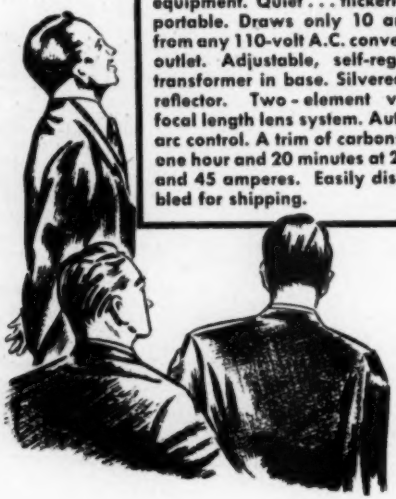

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VOLUME XXVI NOVEMBER 1951 NUMBER 11

The Trail of the Elusive Screen Lumen

By CHARLES HAHN

J. E. McAuley Manufacturing Co.*

Here is a forthright presentation of the views of a leading arclamp manufacturer on the highly controversial topic of the relationship of total screen illumination to aperture light-heat, plus an evaluation of heat radiation and heat absorption methods to prevent film damage. Provocative this article surely is in the light of the views held and often expressed in other responsible quarters of the projection field.

HIGH aperture heat first became a serious problem back in 1929-30 as the first reflector arc lamps using the 9-mm high-intensity type, rotating positive carbons, inadvertently named "Hi-Lo," became more generally used for theater projection. At that time projector manufacturers made their first contribution toward solving the problem by changing the location of the outside revolving shutter from its usual, in front of the projection lens position (front shutter), to its present position between the projector aperture and the light source (rear shutter).

The term "light heat" used herein refers to the thermal rise which follows the stoppage of all, or a portion of, the radiant energy produced by any type of 35-mm projection arc lamp. This thermal rise (heat) increases proportionately with the amount of light extracted from the total light beam as it traverses the axis of the projector optical system.

Three Methods in Use

Today, when more than 16,000 total lumens are to be used on a screen, there are three methods offered as means to afford light-heat protection to the film; yet only one method basically assures positive and consistent results: heat-absorbing glass filters which are inserted in the light beam between the rear shutter of the projector and the light source.

The absorption system is completely protective because its degree of heat filtering is selective and it actually extracts that part of the total heat from the light beam, the cause of film damage, and this before it reaches the projector and film. In consequence, it results in a lower operating temperature of the projector mechanism, and also a lower degree of heat absorption by the projection lens.

The second method is by heat-ray (infrared) deflection, through the use of interference coatings applied to one side of a single piece of heat-resisting glass or fused quartz that is inserted in the light beam, similar to our heat-absorbing glass filters.

Interference Coating Characteristics

Our experience with this type filter has been fairly successful, even in its present state of development, but the deflective coatings have not been too stable and they will deteriorate, gradually disintegrating and breaking down, probably from the higher heat in the center area of the glass, or fused quartz disc, to which they are applied.

Such deterioration of the reflective coatings was found to be greatly accelerated when used with light beams of intensities that produced more than 20,00 total screen lumens, and that such charring or disintegration of the coatings as it progresses become responsible for visible screen light losses of upward to 35%.

Also of importance is the fact that they have not proven to be as efficient as our heat-absorbing glass system because, being of one piece, the total visible light beam from the arc must pass through them when they are in their operating position. Hence, their percentage-wise loss of visible light is a constant, because they do not provide the selective degree feature of heat transmission found in the heat-absorbing glass system.

Because our tests have convinced us this type of filter is not a consistent protective medium, and because the effectiveness of its reflective coatings, due to their inherent fragility, can be seriously impaired by the ever-present hazards of operation, we feel we should eliminate it from immediate consideration, pending further development.

High-Velocity Air Streams

The third method is by heat radiation through the use of high-velocity air streams from jets which are directed against the front and back, or edgewise across, or directly on one or both sides of the film at the aperture opening in the projector mechanism.

First, such high velocity air-cooling systems have an exceedingly high initial cost. They also entail the complication and high cost of installing suitable pip-

* Chicago, Ill. Makers of Peerless projection arclamps.

ing systems, and possibly equalizing valves, to control the jets of air to prevent bending or the bellying of the film at the aperture, which will follow if an unequal air pressure develops on one or the other side of the film.

Power, Filtering Requirements

Another requirement of this system is that to maintain an adequate air supply and pressure, the air source would have to be powered by at least a 2-hp. motor (approximately 1600 watts). It would also have to operate continuously, hence there is a sizeable current cost to be considered. Such a system should also include a fairly large expansion tank, so that the air may cool before it is blown on the film. The air tank should also be provided with a safety valve, should an air compressor be used, and to reduce an excessive accumulation of airborne dirt and airborne moisture in and around the projector mechanism and on the projection lens (which would affect focus), a better than ordinary air filter and air drier must be used.

In the event that a motor-driven rotary air pump is used for the air supply, instead of an air compressor, adequate filtration of airborne dust and moisture becomes a more difficult problem, because such air sources cannot build up the necessary pressure to force the air through really efficient air-filtering mediums.

Small-Area Metal Contact

The ever-present collection of dirt and oily smudge that is seen around any air vent or exhaust fan, ventilating and air conditioning-system outlet is evidence that similar accumulations of dirt and damaging grit is bound to occur in the projector mechanism.

We all know that as film passes through the projector—sprockets, guide rollers, film tracks, tension shoes, etc.—it only comes in contact with the metal parts for a width approximately equal to the width of the sprocket hole area on each edge. Also, that this center clearance is provided for each face of the film to prevent scratches and damage to the emulsion and plain side of the photo frame area.

In our original work with air-cooling systems, we found that due to this center clearance area for the film, when only slightly warped film was used, a high-velocity air stream of sufficient volume to be only slightly effective in radiating the light heat resulted in an accelerated rate of in-and-out-of focus fluttering of the film at the aperture—much more than is normally experienced when no air stream was used; and that such fluttering tendency was again markedly increased when the high-velocity air stream was directed across both faces of the film from an edgewise position.

Studio Work No Criterion

From these facts, therefore, we believe it is erroneous to jump at the conclusion that just because aperture "high-velocity air cooling" contributed to, and in a great measure made practical, the present method of background projection in motion picture studios, it will likewise solve the aperture heat problem for theater projection. The projection principles and problems involved are totally different and unrelated.

From the foregoing it can be seen that this system's high initial cost, high installation cost, and the expense of possible mechanical failure of motors, compressors, blowers, air pump, replacement of filters, and maintenance, all contribute to an exceedingly high operational cost. Even if it were possible to substantiate its sponsors' claim of film protection and screen illumination gain (which to date have not been proven to be anything else than theoretical) the cost of obtaining each such additional theoretical screen lumen would reach an astronomical figure.

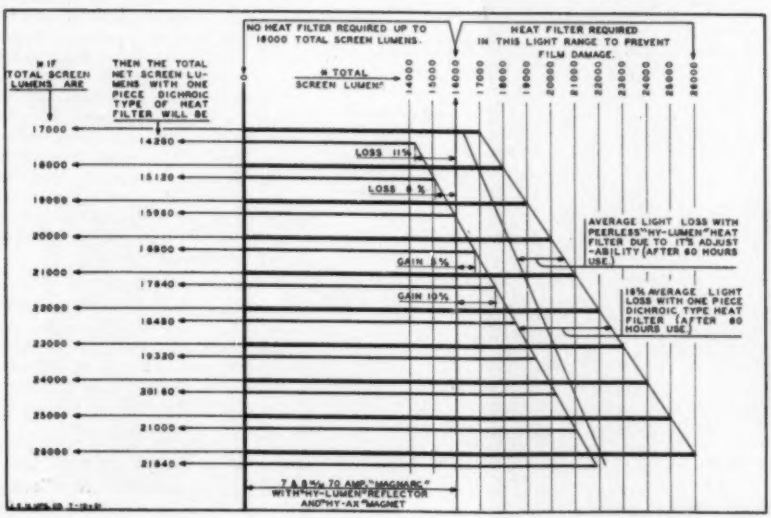
Water-Cooling System

Relative to water-cooled, 35-mm projector film traps, gates, and aperture spot heat shields: sales conversation and, we regretfully add, manufacturers' fallacious advertising have created an erroneous impression that no system of light-heat filtering is required to protect the film against heat damage on such projectors. Our work with projectors so equipped has proven that nothing could be farther from the truth.

The use of water-cooled projector film traps and gates does not in any way reduce the initial temperature impact of the light-heat striking the projector or film. This system can only carry off the higher temperatures that are absorbed by projector mechanism parts. Hence, it can be understood that its effectiveness to even slightly affect the temperature impact of the light on the film itself exposure is completely nil.

Installation, Operating Data

Mechanism water-cooling systems, like air-cooling, also present quite sizeable installation complications, because a water-circulating means must be pro-



HEAT FILTER LIGHT LOSSES

***(See Cols. 1 & 2)**

Obtained using an F:2.0 coated projection lens—without projector shutter, or porthole glass, or #G-292—E Pyrex air deflector, and with no allowance for metal reflector losses or for water-contact cooling devices when used with carbons not designed for such operation.

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vided. In cold weather, or in cases where the normal temperature of a water supply is rather low, a moist condensation can accumulate on the cooled projector parts. Humid weather will also promote the formation of a condensation on the cooled parts.

Finally, while the water-cooling of projector parts may have a beneficial mechanical effect on the projector mechanism, the actual or dollar value of such mechanical benefits would be so infinitesimal and hard to recognize as to not justify its first cost, installation expense and maintenance.

Heat-Absorbing Glass

Comparing now the use of heat-absorbing glass to protect the film from light-heat damage. First, it is extremely simple and definitely effective because it actually extracts the damaging light heat from the total light beam before it reaches the projector mechanism and film.

A filter glass unit consists of a metal frame with provision to hold a total of six strips of filter glass, each ½ x 4 inches and only 1½ mm in thickness. The strips are removable so that only as many need be interposed in the light beam as is required to prevent film damage at the particular current drawn at the arc.

Over-all Light Loss

With the entire six strips in use, the average total visible screen illumination loss is 14% or less. This can be reduced to approximately 7% or 8% when only three or four strips are needed to prevent film damage. Many installations using 180 amperes at the arc are so operating. In most cases, the gain in illumination that will follow the removal of porthole glass will more than make up for the visible light loss of the filter glasses.

By comparison, it is perfectly obvious that for theater projection the absorption system is extremely simple and definitely effective. It entails no high installation cost, complications, or high operating cost. An absorption heat-filter requires only a 1/50-h.p. motor to operate the blower which cools the filter glasses, and the motor need run, if desired, only when the projector is in operation.

20% Loss Figure Arbitrary

Right at this point we believe a correction is in order of the erroneous general impression that the use of glass heat-absorbing filters will arbitrarily result in a visible light loss of 20%. This round percentage figure undoubtedly originated, and would more or less correctly apply, to the first internally-colored heat filter glass that became commercially available. We refer to Nos. 395 and 3966 Aklo heat-absorbing glass of 2 mm thickness.

Also, it must be clearly understood that a laboratory-developed transmission curve will materially vary as a thinner or thicker piece of filter glass is tested. Hence, a round percentagewise figure accepted as the measure of visible light loss that will follow the use of any or all types of heat-filter glass can be misleading.

To speak in round percentage ratios: with No. 3966 Aklo, referred to previously, a 2-mm thickness could be considered as having an optimum heat-absorption ratio of 70% and an optimum visible-ray transmission ratio of 80%. These percentages, however, for reasons stated previously, are subject to change as thinner glass is used. We always used this glass 1½ mm in thickness, thus the optimum visible transmission percentage was more correctly near 83 or 84% when the complete light beam transpierced the six filter glass strips.

New Glass Ups Light Level

Still further favoring the advantages afforded by the heat-absorbing glass system is the newly developed Phosphate-type glass which we have used exclusively for the last four years. Laboratory-developed transmission curves of 2 mm thickness glass show that this type of glass passes an even higher optimum percentage of the visible light rays, about 84%; but because we use this new glass in only 1½ mm thickness strips, this 84% optimum transmission percentage is increased to 86-87%.

It is pertinent to mention here that regardless of the type of high-intensity lamp used, or how large the reflector might be, or the diameter of the carbon combination, or the number of amperes drawn at the arc, it is authoritatively conceded that with the present range of photographic density, if no light heat filter or film-cooling means are used, *the absolute top level* of screen illumination that it is safe to use to definitely avert film damage from light-heat is 16,000 total screen lumens.

This screen lumen figure is to be measured when using either a silvered glass reflector or a condenser lens system, without film in the projector, without revolving shutter light losses, without port glass light losses, but with an accurately aligned optical system.

Hence, the unalterable fact to remember is that it is primarily and *only the film itelf* that is the limiting factor which determines the maximum screen light when no definite supplementary means is employed to prevent film damage from light-heat.

Metal Reflector Data

Referring particularly to reflector-type arclamps, predicated on the high level of the reflectivity of silvered glass reflectors, our illumination limit of 16,000 total visible screen lumens is well within the capacity of 70-ampere arcs using the 7 x 8-mm copper-coated carbon trim. However, if a metal reflector having a "rhodium" reflective surface is used, this 16,000 total visible screen lumens limit is materially reduced, because rhodium-surfaced metal reflectors reflect approximately 20% less of the visible light rays, in wave-lengths of from 4,000 to 7,500 Angstrom units, and at their lower level of visible ray reflectivity they transmit approximately 20% more of the visible heat rays (infrared) in wave-lengths of from 7,500 to 40,000 Angstrom units.

Keeping this inherent inefficiency characteristic in mind, let's assume we were to increase the current of a 70-ampere arc having a metal reflector (by changing to larger diameter carbons so we could accommodate the current increase necessary

(*Continued on page* 29)

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Seated, left to right: Oscar Neu (Neumade Products), retiring president and honorary board member; Roy Boomer, sec.-treas.; J. Robert Hoff (Ballantyne), president; Lee Jones (Neumade), vice-pres.; and W. A. Gedris (Ideal Seating), board member. Board members shown standing, left to right: Bill DeVry (DeVry Corp.); Fred Matthews (Motiograph); Jack O'Brien (RCA); H. B. Engel, W. C. Stober, Ben Adler (Adler Signs); Jack Nolan (National Carbon); Clarence Ashcraft (Ashcraft Mfg. Co.); Ed Wagner (Wagner Signs); Larry Davee (Century Projector Corp).

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Technical Activities of the Motion Picture Research Council†

By W. F. KELLEY and W. V. WOLFE

A résumé of some of the more important activities of the Council and its connection with new products, inventions, television, stereoscopy, standards and test films.

FIG. 1. Mercury-cadmium lamp under test.

BY 1947 it was freely recognized that insofar as methods, processes and equipment are concerned, there was no need for competition among the producers of motion pictures. Accordingly, it was practical to carry on the development of such equipment, processes and methods in a common industry-sponsored technical organization.

With this end in view, the Motion Picture Research Council was separated from the Academy of Motion Picture Arts and Sciences and incorporated under the laws of the State of California. Funds and facilities were made available, and the business of organizing a staff of qualified technical people and securing for them the necessary equipment and quarters was undertaken.

The Research Council is interested in any and all technical problems in the production or exhibition of motion pictures. In general, the activities can be divided into three groups: service functions, short-range development and design problems, and long-range advanced development problems. The staff includes two physicists, three chemists, two mechanical engineers, two electrical engineers and supporting personnel.

Although the Research Council now has its own technical staff and facilities, it needs the guidance of the many expert technicians of the industry. This is provided through a group of 14 basic committees covering every phase of the technical activity of the industry.

The Research Council is a small organization covering a broad and diverse field. Its only possible chance of working successfully under such conditions lies in the cooperation which it seeks and receives from other industries throughout the country.

Set Lighting Developments

Since it is the purpose of the Research Council to serve the motion picture industry, it is not concerned with glory in solving problems, but only with the solution. If any other organization has a satisfactory answer, then the aims of the Research Council have been completely satisfied when that answer is made available to the industry.

Projects of many types and varieties are undertaken by the Research Council, either on its own or in cooperation with other companies. For example, set lighting is one of our most important projects. We will be concerned with it as long as there is a motion picture industry. Presently, we are carrying on work on set lighting in all three branches of our activity, that is to say, service function, short-range design and development and long-range advanced development.

Figure 1 shows a mercury-cadmium lamp under test. The "Man from Mars" helmet is, of course, a standard welder's helmet, equipped with special glass to permit safe viewing of the intense light produced by this mercury-cadmium lamp. Since this lamp is contained in a quartz bulb, it produces high intensities in the ultraviolet, so that artificial sunburn is difficult to avoid. In studying lamps of this type, it is necessary to know as much as possible about their color quality and variation, if any, in color quality as a function of age and various operating conditions. Such studies are made with a spectroradiometer and filtered light meters, and also photographically.

Studies of the zirconium arc, both enclosed and open-air varieties, have been carried on, although for set lighting purposes these arcs do not appear to have sufficient intensity or satisfactory color temperature.

Other New Light Sources

The xenon gas arc has long been known and studied and is perhaps most familiar to us in the flashtubes so successfully used for stroboscopic high-speed photography. Not so well known is the fact that in Germany and England development work has been in progress on a high-intensity xenon arc of capacities ranging up to 1000 w.

In Germany an air-cooled lamp of this type has recently emerged from the research laboratories. It is being watched with care and samples will be obtained by the Research Council as soon as possible. This lamp has better color characteristics, having almost a continuum

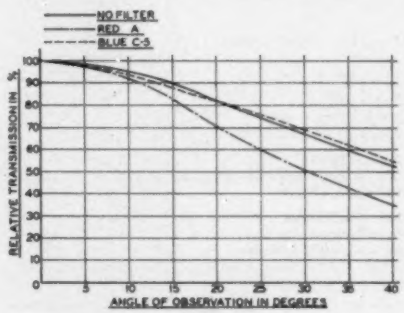

FIGURE 2

Typical brightness fall-off curves—goniophotometer measurements.

† J. Soc. Mot. Pict. & Tv Eng., Feb. 1951.

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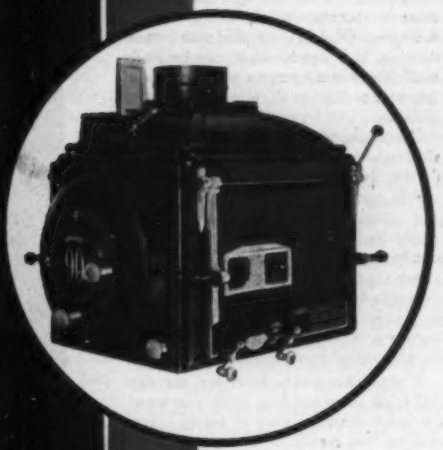

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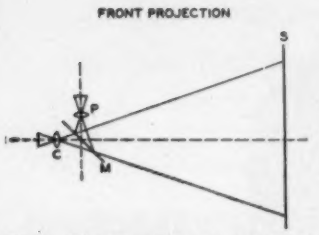

FIG. 3. Schematic drawing of a set-up for front projection.

throughout the entire spectrum and a color temperature of the order of 6000 K degrees (Kelvin), coupled with instant starting. If it can be made commercially available, it can occupy a position of real importance in set lighting for motion pictures.

Composite photography is a matter of vital importance to the motion picture industry. It permits making many shots which would otherwise be impossible, and making many more shots which would be impractical from an economic standpoint if made by any other process. There are two general types of composite photography, commonly called transparency process photography and matte photography. Both of these forms of composite photography are under study.

A goniophotometer built for our special application has been used to measure the color characteristics of transparency screens. The results of one such test are shown in Fig. 2. These tests are verified, wherever that is important, by actual photographic measurements, since it must be constantly borne in mind that the characteristics of the photographic emulsion are an inseparable part of the problem.

The difference in fall-off characteristics of this particular screen sample at the different ends of the spectrum is of obvious importance for color photography, but is also important for black-and-white photography since it must effect the resultant definition in many cases.

The method of making a composite photograph which consists of photographing foreground objects while simultaneously rephotographing from a screen the desired background, can, of course, be employed with a reflection type of screen and front projection as well as with a translucent screen and rear projection.

For example, in Fig. 3, is a simplified setup showing a camera, C, a projector, P, and a diaphone mirror, M. The picture from the projector is reflected by the mirror to the screen, S, and rephotographed by the camera along with the foreground object.

Figure 4 is an example of this type of photography, for the young lady is seated in front of what appears to be an open window through which the city may be seen. Fig. 5 shows what happens if the foreground lights are turned off so that the camera sees only the silhouette and the rephotographed view of the city. This last slide is included primarily to show that the intensity of light required from the projector is insufficient to register on the foreground object even though it is sufficient to provide a brilliant picture of the background. The differences in reflection characteristics are, of course, responsible for the operation of such an arrangement.

FIG. 5. Front projection without foreground lighting.

FIG. 4. Front projection with foreground lighting.

There are many problems in connection with the successful use of front projection. The idea is not new, but its application and limitations have never before been properly defined, which is the primary object of the investigation in that field.

Efficient Screen Types

The industry has long been intrigued by the considerable increase in efficiency which can be obtained with a directional translucent screen as contrasted to a nondirectional screen, but in most cases the requirement for a mobile camera, coupled with manufacturing problems, has prevented the use of such screens. General awareness of the difficulties and the problems involved in a directional screen and acquaintance with much of the earlier work that has been done on this subject have also stimulated the investigation in that direction.

There presently seems some promise

(Continued on page 27)

Projectionist's Role as a Showman

By ROBERT A. MITCHELL

THE motion picture theater performs a *unique* function. It adorns its product with a delicious icing of glamour. By *glamour* the drama-charged atmosphere of the theater is meant. It is an emotional thing. This atmosphere is created, not alone by the screen attractions, but also by the surroundings and the technique of presenting entertainment. In a word, this atmospheric effect is due largely to *showmanship*.

The Chief Showman of the theater is the projectionist. It is he who runs the show and thus delivers the entertainment which the patron pays to see. The quality of the picture and sound reproduction is his responsibility, and the *manner* of presentation determines in the long run whether the paying patron attends or stays away.

Stereopticon Projection

Stereopticon slides, especially the typewritten "Radio-Mat" variety, are something of an eyesore in a modern motion picture presentation. Sometimes, however, the management has good reasons for making special announcements on the screen. It is up to the projectionist, therefore, to make the slides as presentable as possible. There are three aspects to be considered.

First, handwritten or typewritten slides should be prepared as neatly as possible. Fingermarks on them should be avoided. The printed matter should be properly centered and contain no unnecessary wordage. A simple message is the most effective message.

Second, the efficiency of the stereo lantern must be kept up at all times. Condensing and objective lenses require frequent cleaning: because the slide is positioned close to the condenser, any dirt on the condensing lenses shows up more or less clearly on the screen.

Stereo vs. Movie Projection

The difference between a "motion picture" and a stereopticon optical system is illustrated by Fig. 1, wherein the movie optical system utilizes an incandescent lamp and condensing lenses—instead of arc and mirror—to make comparison easier. It will be noticed that in the movie projector the light-source is imaged in the plane of the "object" (film), while in the slide projector the light-source is imaged not on the "object" (slide) but on the *objective lens*.

In order to get maximum screen illumination from a stereopticon, therefore, the incandescent lamp-bulb must be moved forward or back to that position which causes the clearest possible image of the lamp filament to be forced *on the objective lens*, thus giving uniform screen illumination.

The stereo projector should be set up beforehand so that the slide aperture image is properly centered on the screen. And the objective lens should be focused before the show and locked in position, if this is possible.

If the image of the clear stereo aperture happens to be slightly larger than the screen, well and good. Experimenting with cardboard aperture masks will enable determination of the proper size and shape of slide aperture needed to match exactly the size and rectangular shape of the motion picture screen image. A sheet-iron aperture plate can then be made and permanently fitted to the stereo. Typewritten slides may then be used without the undersize paper masks which are furnished with them.

The third aspect is the smooth transition from movies to slide and *vice versa* —a matter of operating technique and showmanship.

If the stereo lamp can be turned on and off by means of wall switches, one near each projector, a smooth change-over can easily be effected. Otherwise the projectionist is forced to exert considerable prowess as an acrobat to avoid a "dark screen" or a prolonged period of "double exposure." With the proper control facilities, the projectionist can use the title curtain and, when thought desirable, a few bars of appropriate music from the non-sync.

Color on the Stereo Image

Slides can sometimes be "pepped up" by coloring the stereo light by means of small sheets of suitably tinted cellophane or spotlight gelatine stretched tightly in a color wheel or other holder placed before the objective lens. Pink, amber, yellow, green, blue, red, violet, *etc.*, can be interchanged frequently when slides are used at every show.

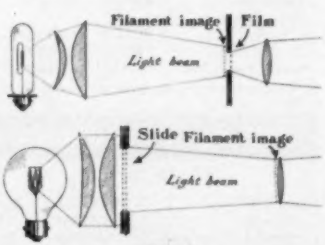

FIGURE 1

Comparison of the optical systems of motion picture (top) and stereopticon (lower) projectors. In the stereopticon, the image of the light-source is formed on the objective lens instead of on the transparent picture, as in the movie projector.

The tinting of motion picture prevue trailers in this manner has been all but abandoned, now that natural color trailers are common. The practice was formerly useful for "tying together" the two trailers of a double-feature bill. For example, prevues of a double-feature "horror show" could be projected through green or violet gelatine. Amber, yellow, or pink might be suitable for most other double-feature combinations.

As an alternative to "gelatining" the projector light, colored light—footlights, striplights, or a spotlight—can be used to illuminate the screen during black-and-white trailers. This gives the effect of "toned" film, rather than all-over tinting. BUT—guard against overdoing a technique which is pleasing when used sparingly and on appropriate occasions. Sound showmanship involves restraint as well as innovation.

Closely allied to this topic is the color-flooding of titles, a matter to be examined later.

Pre-Show Preparations

Preparation for a show is a routine matter. The projectors are thoroughly cleaned and oiled before the show; and adjustments are made in the equipment when such are necessary. The sound equipment is checked by making "click" tests of both the non-sync and the sound-on-film reproducers. The main line voltage, the voltage output of exciting-lamp rectifiers, and the plate current of amplifier power tubes are read from the meters with which certain makes of sound equipment are fitted. The arc-lamp generator (or rectifier) is checked for faults; and the lamps themselves are cleaned, lubricated and trimmed with carbons of sufficient length to run at least one reel of film.

The importance of keeping the lamp mirrors clean at all times cannot be overemphasized. The white dust which settles upon them is a metallic, or *basic*, oxide which reacts, when hot, with the *acid anhydride* of glass, thus etching, or "frosting," the glass in time. Then too, spots of soot (finely divided carbon) on the glass may cause the mirror to crack unexpectedly, a matter to be discussed later.

Keep a small pad of paper on your desk or on the rewind bench and use it

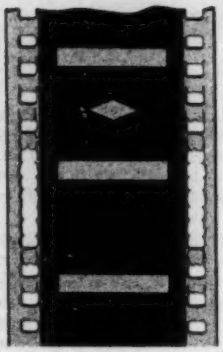

FIGURE 2
Torn-out perforations on film leader.

for jotting down all defects in the equipment or its performance noticed during actual projection. Many minor faults can be corrected during a show without interrupting the performance; but some, such as a bad optical line-up of the projectors or a noisy intermittent must wait until the show is over.

A long and complicated list of procedures could be formulated to provide a comprehensive "make-ready" routine; but most projectionists simply do not have the time to do *everything* every day. Certain duties must be doubled up on alternate days, and certain others are best placed on a once-a-week basis.

Every projectionist knows from experience the things that *must* be done, and also how long he can safely defer them. No projectionist need "knockdown" a projector mechanism once a week or even once a month just to establish good working condition. Once the equipment has been put in the best condition possible, a few minutes' inspection every day —and there is ample opportunity during the day for looking at all equipment— will provide sufficient warning of defects which may be developing.

Film Inspection Vital

There is one part of the pre-show preparation which, alas, is sometimes carried out too hastily. The film exchanges are morally and legally responsible for issuing prints in perfect running condition, but any projectionist who implicitly relies on exchanges will soon come to grief. There are three dangers in film breaks, namely:

1. Fire-risk of breaks in nitrate films.
2. Danger of damaging the projectors.
3. Danger of creating patron annoyance and dissatisfaction with theater, resulting in loss of business.

Not one splice, not a dozen splices, but *every splice* in *every reel* should be tested for strength and sprocket-hole registration. Splices occurring in "fades" should be checked for correct framing. It hurts the dramatic power of a picture to have the screen image suddenly jump out of frame. Roughened and sheared edges of the film should be smoothed with scissors. "Sprocketed" film and otherwise mutilated footage should be cut out, rolled up, and tossed into the shipping case for return to the exchange.

Motor and changeover cues should be checked for visibility, scoring them by means of a professional cue-marker when they seem to be too faint. (But it is surprising how faint they can be on the film and still be easily seen on the screen!)

Any special cues, such as cues for curtains that take longer than 7 seconds to close, should be marked on the film, *not* by scoring or scratching the emulsion but with a china-marking pencil, *and wiped off before the print is shipped out.* The nuisance of having to add cues for the title curtain can be eliminated by speeding up the curtain so that it closes in 6 or 7 seconds from the time that the curtain-control button in the projection room is pressed. Nothing more complicated than changing the old curtain drive pulley to one of slightly greater diameter is needed in most cases.

Film Leader Deficiencies

Standard release print film leaders, especially those which contain several splices, should be inspected inch by inch. A film-break during a changeover is extremely irritating. Avoid this danger by making sure that every splice in every leader is as strong as the film itself, and that no torn perforations are present. Also, successive splices in any film should not be closer together than 10 inches, else the perforations may be weakened by the teeth of the intermittent sprocket.

A clip from a leader having torn-out perforations is shown in Fig. 2. A similar defect consists of an extended crack running from perforation to perforation on both edges of the film. This defect is a hard one to see and is best detected by "cupping" the film during inspection of leaders; it is just as dangerous as perforations completely torn out.

'Running Down' the Film

Film damage of these types is caused by a sudden yank or pull on the film, causing sprocket teeth to rip right through the perforations. The projectionist can do much to prevent torn sprocket holes. Before switching on a projector, be sure that there is no slack in the film between upper reel and the upper feed sprocket, or between lower takeup sprocket in the soundhead and the takeup reel. Slack film at either of these points can cause damage to film perforations. The projectionist who has formed the good habit of running down a few frames of film after threading up need have no worries on this score.

(*Continued on page 26*)

"Business Week"© Magazine Assays the Movies' Economic Status

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MOVIE MAKERS: A COMEBACK IN 1951?

	Earnings for Fiscal Years					
	1939	1946	1947	1948	1949	1950
Columbia Pictures	$2,000	$3,480,000	$3,707,000	$565,000	$1,008,000	$1,981,000
Loew's, Inc.	9,842,000	18,492,000	11,626,000	5,310,000	6,745,000	7,854,000
Paramount Pictures Corp.	—	18,701,000*	10,733,000*	5,842,000*	3,261,000*	6,565,000
RKO Pictures Corp.	—	6,271,000*	D1,787,000	D5,596,000	D4,319,000	D3,832,000
RKO Theatres Corp.	—	6,073,000*	6,360,000*	3,974,000*	4,173,000*	1,196,000*
Republic Pictures	1,061,000	1,090,000	$70,000	D390,000	487,000	761,000
20th Century	4,147,000	22,620,000	14,004,000	12,509,000	12,415,000	9,553,000
United Paramount Theaters	—	20,498,000*	17,508,000*	16,737,000*	17,575,000*	12,142,000*
Universal Pictures	2,253,000	9,195,000	6,745,000	D2,163,000	D1,126,000	1,386,000
Warner Brothers	1,741,000	19,425,000	23,095,000	11,837,000	10,467,000	10,272,000

*Pro forma. Paramount split on Dec. 31, 1949; RKO on Dec. 31, 1950. D—deficit.

THIS YEAR'S SHOWING SO FAR

	1950	1951	
Columbia Pictures	$1,981,000	$1,498,000	Fiscal year ending June 30.
Loew's, Inc.	6,019,000	5,368,000	40 weeks ended Jun. 7, '51, Jun. 8, '50.
Paramount Pictures Corp.	2,826,000	2,832,000	Six months ended June 30.
RKO Pictures Corp.	NA	D735,000	Six months ended June 30.
RKO Theatres Corp.	NA	$82,000	Six months ended June 30.
Republic Pictures	$31,000	728,000	39 weeks ended July 28, '51, July 29, '50.
20th Century	3,136,000	1,071,000	Six months ending June 30.
United Paramount Theaters	6,883,000	5,128,000	Six months ending June 30.
Universal Pictures	979,000	1,127,000	39 weeks ended July 28, '51, July 29, '50.
Warner Brothers	7,316,000	5,809,000	Nine months to May 26, '51, May 27, '50.

The Allied Arts and Sciences

A vast field of artistic and scientific endeavor is directly contributory to the motion picture process and, therefore, to the practice of projection. The true craftsman should have a well-rounded understanding of these contributory factors, particularly in view of the imminent widespread utilization of television and, possibly, stereoscopic pictures and stereophonic sound. This department will provide basic information on the aforementioned arts and sciences, a wide variety of topics being a primary aim.

III. Photographic Optics

Bausch & Lomb Optical Company, Rochester, New York

OUR lenses must not only give us good images, they must pass light, and illuminate the negative. Further, this illumination must be known and controllable, so the exposure will be subject to our will.

It is fairly clear that the larger the opening in a lens the more light it will admit. Further, we were apprised earlier that the longer the focal length of the lens, the larger the image at a given object distance. Now, in the larger image the light sent out by the object points is spread over a larger area, yielding a dimmer image. There is, as can be demonstrated both mathematically and practically, a reciprocal relationship between the image area and the illumination at constant aperture, so that as the image grows larger (longer focal lengths) the less the illumination.

Illumination Determinants

Now if at the same time we were increasing the image size we were increasing the *area* of the lens opening, we would obviously be maintaining the illumination in the image, and could make our exposure at the same shutter time. Thus at a given object distance (and we shall take an object at infinity), the illumination in the focal plane of an objective is determined by two factors, the area of the lens and its focal length.

Mathematically, the most convenient expression for the speed of a lens is given by the ratio of the focal length of a lens to its diameter. This is the relative aperture and is the standard denomination of lens speed today. For instance, if we have a lens of 4 inches focal length and 2 inches diameter, its relative aperture will be 4 divided by 2, or F:2. If the diameter were 1 inch, the lens would be F:4.

A 2-inch diameter pipe will carry 4 times the water a 1-inch pipe will, that is, the area of the pipe varies as the square of the diameter. Just so will the speed or light gathering power of a lens vary as the square of its diameter. It is found that the illumination in the image varies inversely as the square of the relative aperture, and for this reason the sequence of relative apertures is by common agreement in steps of the square root of 2. Each step means doubling the illumination.

Lens Field off the Axis

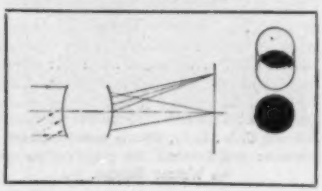
So far we have considered the illumination on the axis of the lens. Everything we have said holds good also in the field of the lens off the axis, but there some further effects enter to complicate the issue.

For one thing, the image-forming light strikes the film at an angle, which lowers the efficiency of the photographic effect, and even more important, at large angles to the exis the effective aperture of the lens is reduced by reason of the separation of the front and rear elements, and because the round diaphragm off axis elongates like a cat's eye (Fig. 24).

All these effects cooperate to produce what can be a marked diminution of illumination at the corners of the picture area. These effects are generally known as *vignetting* and are serious in the case of wide-angle lenses particularly. The effects are seldom seen in photographs with lenses of normal focal lengths, for the characteristics of sensitive film are such as to hide them.

The illumination from a point source of light varies inversely as the square of the distance. This is elementary, and lies at the root of illumination theory. But, we might ask, if that is so why is it unnecessary to compensate for distance when making an exposure? Why is it that the same exposure is required for a nearby tree as for a distant one?

FIG. 24. Vignetting.



Exposures Near and Far

This puzzling question has really a simple explanation, one illustrative of the fundamental principles we have been considering.

Consider two trees, situated, say, 20 feet and 40 feet from a camera. The nearer tree will send 1-over-20-squared, or 1/400 units of light, to the camera; while the farther tree will be emitting 1-over-40-squared, or 1/600 units. Thus the nearer tree illuminates the negative plane with 4 times the light its farther counterpart does.

So far so good, but consider a bit farther. The size of the image must also vary with distance. In fact, the magnification is inversely proportional to the object distance. Then the height and breadth of the nearer tree will be just twice that of the farther one, since it is one-half the distance from the camera.

But the areas of the images of the two trees will be given by the products of their linear dimensions, and thus the nearer tree will cover 4 times the area of the farther tree. The nearer tree sends 4 times the light to the camera, distributing that light over 4 times the area, so that each element of film receives the same illumination from the one tree that it does from the other. That is to say, the exposure is the same for both trees.

This argument can be generalized to demonstrate that the exposure is independent of distance. Of course, in this argument we have neglected such things as aerial perspective, haze, *etc.*

Effective Relative Aperture

There is one important reservation to remember in the matter of relative aperture. We have seen that the most convenient measure of the speed of a lens is its relative aperture, or ratio of focal length to stop diameter. This gives a measure of the light-gathering power of a lens when focused on an infinitely distant object. What happens when focusing on very near objects?

We saw that the illumination is independent of distance because of the magnification. This magnification in turn is a function of the lens-to-film distance, such that the distance can be looked on as the equivalent of the focal length so that instead of the focal length being the primary quantity in determining the relative aperture, it is in reality the lens-to-film distance which is most important. Thus in making close-up shots, we cannot use the simple relative aperture as marked on the lens, but must make due allowance for the bellows extension.

For instance, if we are using our lens at one-to-one magnification—*i.e.*, a bel-

(*Continued on page* 24)

IN THE SPOTLIGHT

By *HARRY SHERMAN*

FOR many years the motion picture industry has been notoriously lax in that it did not make use of its own medium, recognized world-wide as having a terrific impact, to promote its own interests. We were reminded of this recently when the progressive Bakery and Confectionery Workers' International Union stepped out and released "It's Up to You," a half-hour motion picture film which deals with accident hazards, safety methods and sanitary working conditions in plants where its members work.

Working from a meeting of a Union safety committee, the film "flashes back" as each member reports on a separate safety and sanitation subject, detailing the type of injury sustained and outlining preventive methods. The film goes beyond the individual worker's responsibility for *his own welfare* and deals with *management's* responsibility in providing safe and healthful workplaces, making the point that safety and health provisions are not "extras" but an integral part of plant and equipment.

If the people who make doughnuts and biscuits can utilize our medium to get fine results, so can we. Such a film would be a pushover for our craft on the basis of the various units working in concert. Our pet project, for example, of vastly improved sanitary conditions in projection rooms could be stressed in such a film, with the sharp contrast afforded between a first-class room and a mere hole-in-the-wall. And plenty of other angles could be covered.

Such a film could be circulated all over the country at Local and District meetings. Any thoughts on this topic?

• Bill Thompson, business representative for Pittsburgh Local 171, has fully recovered from his recent illness and is back on the job. Good Luck!

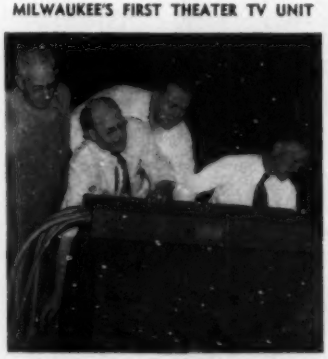
• William Tenney, president, and Douglas Calladine, past president, Vancouver Local 348, conferred with IA President Walsh in New York recently on the deadlock now existing in the long-drawn out negotiations with Famous Players Canadian Theaters. Local 348 is asking for a wage increase of 50c per hour, plus a cost-of-living bonus of 1.1c per hour for each point rise in the cost of living. To date, Famous Players has countered with an offer of 35c per hour and no cost-of-living bonus.

The jurisdiction of the Vancouver Local takes in a vast territory covering an area of 400 miles wide by 600 miles long. It is not unusual for the Local to fly a man to fill an emergency job, a number of the theaters being located in sparsely-populated areas that have poor transportation facilities.

Although the members voted overwhelmingly to go on strike unless the Local's demands are met, our information is that the matter will be amicably settled very soon.

• The N. Y. State Ass'n of Motion Picture Projectionists held its annual conference in the meeting hall of Tobis Tavern, Auburn, N. Y., on Monday, November 5. The first session of the conference was held in the afternoon and was given over to a lecture on theater Tv by Dr. T. G. Veal, research engineer for Eastman Kodak Co. Dr. Veal's talk was most informative and gave the delegates a clear conception of the video art.

MILWAUKEE'S FIRST THEATER TV UNIT



Checking the installation of the Tv projector at the foot of the balcony in the Warner Theatre (2500 seats) are, left to right: Adam Schneider, Local 164, graduate of the IA-RCA Tv school; D. MacMillan, RCA service engineer; Glenn C. Kalkhoff, president of Local 164, and C. W. Burns, Warner sound engineer. Schneider and Kalkhoff are projectionists at the Warner Theatre.

At the evening session it was agreed that all officers, present and future, will automatically become honorary delegates to future meetings, regardless of whether they are accredited delegates. Also agreed was that the Association will hold two meetings each year—Spring and Fall.

Not forgetting sentiment, the delegates sent a round-robin letter to P. A. McGuire, former advertising manager for International Projector Corp., who retired from all activities several years ago. Mac was an honored guest at many State gatherings, and the boys have a warm spot in their hearts for him.

Delegates present represented Locals 108, Geneva; 119, Auburn; 121, Niagara Falls; 253, Rochester; 272, Cortland; 311, Middletown; 324, Albany; 337, Utica; 376, Syracuse; 396, Binghamton; 474, Rome-Oneida; 480, Corning; 581, Batavia, and 609, Little Falls.

• We regret to record the death of E. P. Lenhoff, former secretary of Local 548, Paris, Texas. We never met E. P. personally, but we staked out some common ground via the correspondence route through the years. A wife and daughter survive—and to them our heartfelt sympathy.

• A note from our friend Ralph Root, Sr., long-time business representative for Local 236, Birmingham, Ala., informed us that his son, Ralph, Jr., an electronics engineer for RCA at Biggs Field, El Paso, Texas, was notified that he was being transferred to Washington, D. C., in charge of a most important project. A proud dad of a mighty fine son.

• Theater Tv was featured at the Allied Theater Owners Convention held last month at the Biltmore Hotel, New York. Several theater Tv systems were on display, each one attracting considerable attention from the visitors. Only the GPL, of all the Tv systems on display, utilized the services of a projectionist. We commend the "powers that be" be-

hind this system for their foresight in recognizing the fact that the projectionist is an important factor in the proper presentation of theater Tv. Elsewhere in this issue will be found an article relating to the lecture and demonstration of the GPL theater Tv system given at a recent meeting of the 25-30 Club of Greater New York.

• The recent IA executive board meeting, held in New York, brought in many officials from all parts of the country and afforded us an opportunity to get together with many of our old friends. It was particularly good to see Orin Jacobson, IA representative for the past 21 years, who was elected IA eighth vice-president to fill the vacancy created by the death of Floyd Billingsley, Local 162, San Francisco. Orin is a former official of Local 175, Tacoma, Wash., and for many years served as secretary of District No. 1.

ORIN JACOBSON
Tacoma, Wash., L. 175 man named 8th vice-president of IA, succeeding the late Floyd Billingsley.

• While chatting with R. J. Fisher, member of Local 253, Rochester, N. Y., we learned that Cal Bornkessel, old-time member and official of the Local, has recovered from a serious operation and is again working at the RKO Theater. Fisher, incidentally, was president of the Local back in 1914.

• A midnight banquet marked the 14th anniversary celebration last month for Local 703, Du Bois, Penna. Among the honored guests were IA Representatives John B. Fitzgerald, Cleveland, and Larry Katz, Harrisburg. John Cheri, who has served as the Local's attorney since it was chartered in 1937, was the principal speaker of the evening.

Among those present were F. P. "Reel" McCoy and Phil Bordonaro, Local 444, New Kensington-Tarentum; a delegation from Pittsburgh Local 171 headed by Martin Torreano, president; Bill Thompson, business representative; James Sipe, secretary, and the entire Local 171 executive board.

• Local 343, Omaha, Neb., lost one of its oldest members by the death last month of Frank A. Lewis at the age of 91. Lewis worked in many Omaha theaters, and although he retired a number of years ago, he still retained his card in the Local.

• We are amused to see how some men, important figures in their particular fields, become as helpless as children when they are indisposed. Recently, while on a visit to New York with his wife, Bert Ryde, business representative for Buffalo Local 233, fell ill. Mrs. Ryde lost no time in bundling him up and, despite all his protestations, got him off on the train headed for home. Bert, the self-assured and confident union official, meekly submitted and later admitted, although somewhat reluctantly, that he had bowed to superior intelligence.

• History sure do repeat itself—in this case for Fred Raoul, general secretary-treasurer of the IA. About 27 years ago Fred broke a leg while on a Florida sojourn. Recently, after dropping off Orin M. Jacobson, newly-named IA 8th vice-president (the Tacoma lucky boy) at his destination, the Raoul car was hit by another car manned by a group of teen-agers.

The smash-up resulted in a ditto break of the same leg for Fred, while Mrs. Raoul sustained a broken thumb. Fred will be incapacitated for some weeks. Mr. Jacobson? Lucky Boy arrived safely at his destination.

• William P. Covert, 2nd IA vice-president and business representative for Toronto Local 173, recently concluded negotiations with the exhibitors in his jurisdiction which provide for substantial increases for the Local. The new contracts with Famous Players and its subsidiaries allow a wage increase of $5.25 per week per man, plus $10 per week cost-of-living bonus. Since September last, the cost-of-living bonus has been increased 50c per week.

WILLIAM P. COVERT
IA vice-president and business rep. of Toronto L. 173 gains wage tilt in Famous Players (Canada) theaters.

The independent houses agreed to a straight increase of $10 per week per man, plus paid vacations which in some instances extend to three weeks annually. Projectionists employed in the film exchanges also received a $10 a week increase. The booth cost in one of the theaters in Oshawa was boosted an additional $34 per week, or $17 per week per man.

Negotiations for the Local were conducted by Covert, R. Sturgess, and Pat Travers, ably assisted by executive board members Roy O'Connor, Jack Hills, Norman Tanner, Lou Lodge, Art Milligan, and Geo. Jones.

• Joe Cifre, member of Boston Local 182 and head of the theater equipment supply firm that bears his name, is conducting a one-man drive to spur the collection of copper drippings. Joe has appealed to all IA Local Unions, theater owners, and theater managers throughout New England to expand every effort to salvage every last bit of copper scrap, to be sent to his office at 44 Winchester St., Boston 16, Mass. He will see that the scrap is forwarded to the proper governmental agency.

• Completion of the two-year contract negotiated last month between IA West Coast Locals and the Association of Motion Picture Producers was delayed due to a misunderstanding over the interpretation of the cost-of-living wage increase provided for in the agreement. However, we have been reliably informed that the producers have agreed to the IA's original demand to reopen wage discussions when the cost-of-living is increased 5% or more, the calculating basis to be the October 15 Bureau of Labor Statistics Index.

WILKES-BARRE, PA., MEN (IA LOCAL 325) ADMIRE THEIR NEW PROJECTION EQUIPMENT

Showing the first installation of the new Ashcraft Hydro-Arc lamp in the Penna. area at the Paramount Theatre. Left to right: Harvey Eggleston, president of L. 325; Joseph Malloy, Robert Platt, Jr., secretary-treasurer of L. 325, and William Platt.

Theatre Screen Brightness Survey

A Report by the SMPTE Screen Brightness Committee†

W. W. LOZIER, Chairman

A PRELIMINARY survey of 18 theaters by the Screen Brightness Committee in 1947 disclosed interesting indications of theater screen illumination practice in this country, but was inconclusive because the theaters covered represented too limited a sampling. A more extensive survey was not carried out at that time because of the lack of a suitable meter.

More recently, General Electric Co. placed at the disposal of the Committee a meter which is better adapted to a theater survey. Consequently, during the summer of 1950, the Committee undertook a survey of screen illumination and related factors in 100 representative indoor theaters. It was the purpose in this larger survey to cover a more representative segment of the theaters in this country and to obtain dependable data concerning their practices, with the underlying thought that observation and discussion of any undesirable conditions would promote better projection.

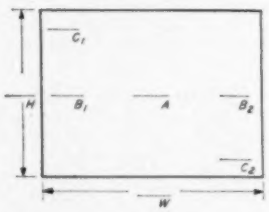
At the present time, results are available on 125 theaters, representing all except the Southeast and Pacific sections of the U. S. It is believed that these re-

† Jour. of SMPTE, Sept. 1951, p. 238

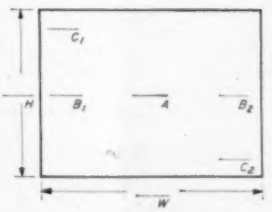
SCREEN BRIGHTNESS COMMITTEE
THEATER SURVEY

THEATER _____ DATE _____
ADDRESS _____ REPORTED BY _____

PROJECTOR 1



PROJECTOR 2



READ INTENSITY ON THE SCREEN IN FOOT-CANDLES AT THE FIVE POSITIONS INDICATED. "C_1" AND "C_2" ARE LOCATED $\frac{1}{20}$ OF H FROM EDGES AND $\frac{1}{20}$ OF W FROM SIDES. "B_1" AND "B_2" ARE ON THE HORIZONTAL CENTER AND $\frac{1}{20}$ OF W FROM SIDES. "A" IS IN THE EXACT CENTER.

SCREEN AREA
AREA IN SQUARE FEET = $H \times W$ = (1)
SCREEN LIGHT INTENSITY AND DISTRIBUTION
RATIO $\frac{B_1 + B_2}{2} \times \frac{1}{A}$ =
RATIO $\frac{C_1 + C_2}{2} \times \frac{1}{A}$ =
SCREEN LUMEN CALCULATION
$A \times 2$ =
$B_1 + B_2$ =
$\frac{C_1 + C_2}{2}$ =
TOTAL =
WEIGHTED AVG. = $\frac{\text{TOTAL}}{5}$ = (2)
SCREEN LUMENS = (1) × (2) =

SCREEN AREA
AREA IN SQUARE FEET = $H \times W$ = (1)
SCREEN LIGHT INTENSITY AND DISTRIBUTION
RATIO $\frac{B_1 + B_2}{2} \times \frac{1}{A}$ =
RATIO $\frac{C_1 + C_2}{2} \times \frac{1}{A}$ =
SCREEN LUMEN CALCULATION
$A \times 2$ =
$B_1 + B_2$ =
$\frac{C_1 + C_2}{2}$ =
TOTAL =
WEIGHTED AVG. = $\frac{\text{TOTAL}}{5}$ = (2)
SCREEN LUMENS = (1) × (2) =

FIG. 1. Sample data form for incident screen illumination.

SCREEN BRIGHTNESS SURVEY

CENTER SCREEN BRIGHTNESS AND REFLECTIVITY

Incident Illumination X Screen Reflectivity = Screen Brightness

METHOD A

When using a combination illumination and brightness meter, measure center of screen values of incident illumination and Screen Brightness, and calculate Screen Reflectivity, using the above equation.

METHOD B

When using a reflectivity meter, measure Screen Reflectivity and combine with Incident Illumination to calculate Screen Brightness, using the above equation.

	PROJ. 1	PROJ. 2
Incident Illumination Ft.-Candles	_____	_____
Screen Reflectivity, %	_____	_____
Screen Brightness Ft.-Lamberts	_____	_____

FIG. 2. Sample data form for screen reflectivity and screen brightness.

SCREEN BRIGHTNESS SURVEY

Projection Data

1. Projection Angle
2. Arc Lamp Type
3. Positive Carbon
4. Negative Carbon
5. Arc Amperes
6. Arc Volts
7. Projection Lens
   (a) F-Number
   (b) Focal Length
   (c) Surface Coated
8. Type of Shutter
   (a) Degree Opening
9. Draft Glass Type
10. Heat Filter Type
11. Projection Port Glass
12. Type of Power Supply
    (a) Rating in Amperes
    (b) Rating in Volts
    (c) Operating Voltage

Auditorium Data

1. Seating Capacity

FIG. 3. Sample theater data form.

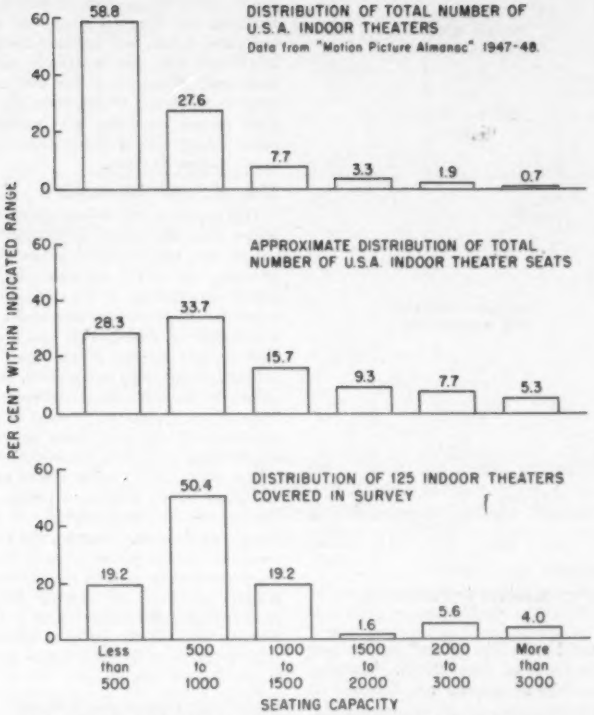


FIG. 4. Capacities of survey theaters and total indoor theaters.

sults would not be greatly changed by representative coverage of these additional areas.

During the course of this survey, the Motion Picture Research Council became interested in carrying out a parallel survey in the West Coast studio review rooms used for viewing 35-mm pictures. Through their cooperation, we are able to include in this report the results on 18 review rooms.

Methods and Instruments

In contrast with the previous survey, all of the measurements in the present survey were made with an objective-type instrument requiring no visual photometric balance. Nearly all of the measurements were made with the two-cell G. E. combination screen illumination-screen brightness meter. A few measurements were made employing a simple foot-candle meter in combination with an improvised device for measuring the screen reflectivity.

Data forms were simplified somewhat from those used in the 1947 survey and are illustrated in Figs. 1 to 3.

Classes of Theaters Surveyed

The 1947 survey was heavily weighted by the large downtown theaters in large cities. An effort was made in this survey to cover a wider range of types and sizes of indoor theaters. Fig. 4 shows the distribution of seating capacities among the 125 theaters surveyed. It also shows the distribution of seating capacities among the indoor theaters of the U. S. expressed both on the basis of percentage of theaters in various seating ranges and also as the percentage of the total theater seating capacity falling in the different seating-capacity ranges.

It is seen that the distribution of theaters covered in our survey corresponds more closely to the distribution of the total U. S. theater seating capacity than to the distribution of number of theaters among the various seating ranges. While the less-than-500-seat theaters account for over half of the total number of indoor theaters, they account for only a little more than one-quarter of the total number of seats.

Figure 5 gives the distribution of screen widths measured thus far. All but a small fraction of the screens were between 14 and 24 ft. in width, with the average at approximately 18 to 20 ft.

Screen Brightness Distribution

The distributions of screen brightness encountered with 36 review-room projectors and 245 indoor-theater projectors are given in Fig. 6. The present ASA standard limits, also shown in Fig. 6, call for a brightness between 9 and 14 ft.-L. The indoor theaters ranged in brightness from 3.4 to 53 ft.-L, with approximately one-quarter below and about one-half within the ASA standard range. Two theaters which were equipped with highly directional "silver" screens had a central maximum screen brightness in the range of 30 to 53 ft.-L. In the case of the review rooms, almost two-thirds were within the standard limits, and most of the remaining third exceeded the maximum limit.

Over-All Screen Illumination

Figure 7 shows the distribution of illumination over the screen expressed as a ratio of side-to-center intensity of incident illumination. Side distribution ranged from 40 to 94% for the indoor theaters, with approximately 85% of the

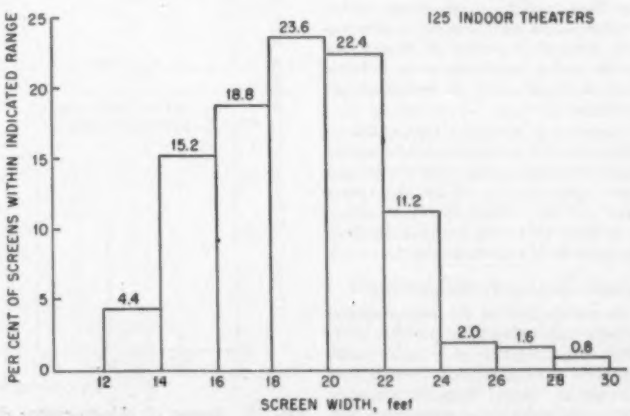


FIG. 5. Distribution of screen widths covered in the survey.

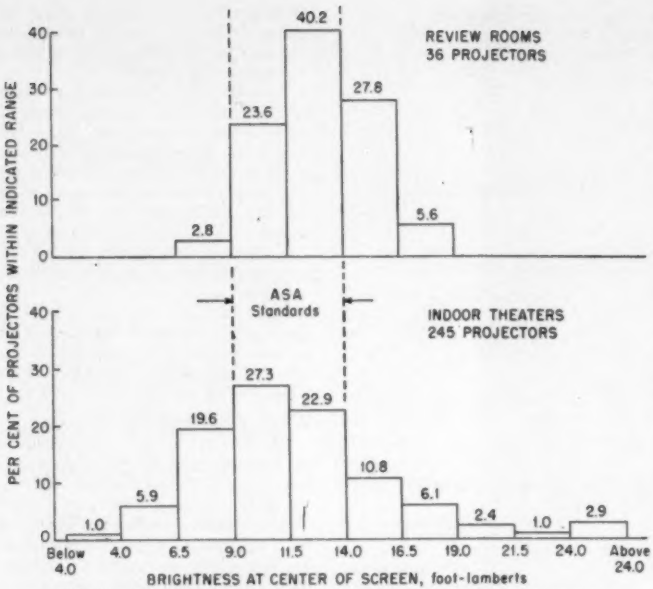


FIG. 6. Distribution of screen brightness obtained in the survey.

projectors falling between 50 and 80% distribution ratios. The most frequent distribution ratio was 60-70%.

The review rooms differ radically from the indoor theaters by having a much more uniform distribution of illumination over the screen. Of the review-room projectors, 85% produced a side distribution between 80 and 100%.

Review-Room Screen Problem

This more uniform screen distribution reflects the review-room problem of small screen size and excess illumination; defocusing the light source to produce a uniform distribution is one way which has been used to reduce excess screen brightness. It means, however, that motion pictures are viewed in these review rooms under conditions very different from those prevailing in motion picture theaters.

Figure 8 gives similar information on the ratio of corner-to-center incident intensity. Corner distributions are, in each case, approximately 10 to 15% lower than the side distribution and ranged from 26 to 83%. Fig 8. shows, however, the same basic pattern as Fig. 7.

Screen Reflectivity Range

Less than half of the indoor theater screens had reflectivities in the 70 to 80% range, typical of a matte white screen in good condition. Over 40% of the screens ranged from 70 down to 32% reflectivity. Approximately 10% of the screens had reflectivities between 80 and 100%. Five "silver" screens were in the range of 150 to 250%. A total of eight "silver" screens are included in Fig. 9.

The review-room screens, on the average, tended to have lower reflectivities than the indoor theaters, but not as great a range of extremes. This may again reflect the problem of excess illumination and the fact that even a deteriorated screen will produce adequate brightness with the small-size screens employed. However, if the low reflectivity is the result of deterioration, then such screens may also have undergone color change with resultant distortion of color motion pictures.

25% of Total Sub-Standard

This survey of 125 indoor theaters has shown that the screen brightness falls within the recommended range for a little over half of the projectors, but that almost one-quarter of the theaters are below the recommended standards. The distribution of illumination over the indoor theater screens ranges from very uniform to extremely nonuniform. Screen reflectivity for the indoor theaters ranges from values typical of screens in good condition all the way down to values representing over 50% deterioration.

The West Coast review rooms generally show screen brightness within or a little above the recommended standards for indoor theaters. However, the review rooms differ from indoor theaters in having exceptionally uniform distribution of illumination over the screen. Review-room screen reflectivities show a lower average value than, but not nearly as great a spread of extreme values as, the indoor theater screens.

Three-Year Improvement Noted

Compared with the 1947 preliminary survey, the present one shows an even wider range of screen brightness values, but only about one-half as great a pro-

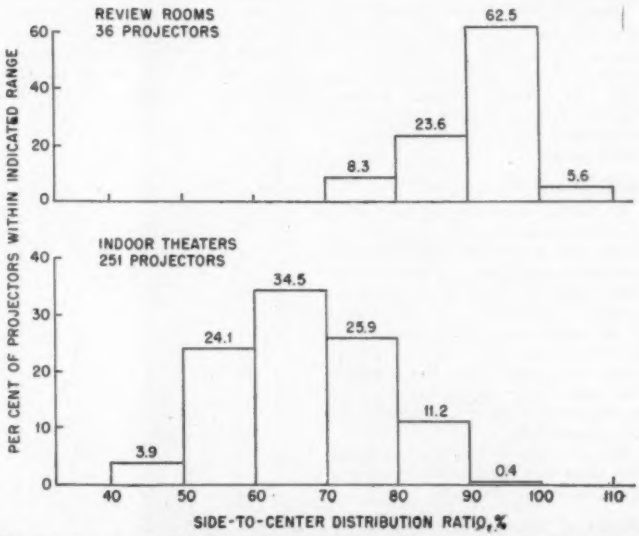


FIG. 7. Range of side-to-center distribution ratios of incident illumination obtained in the survey.

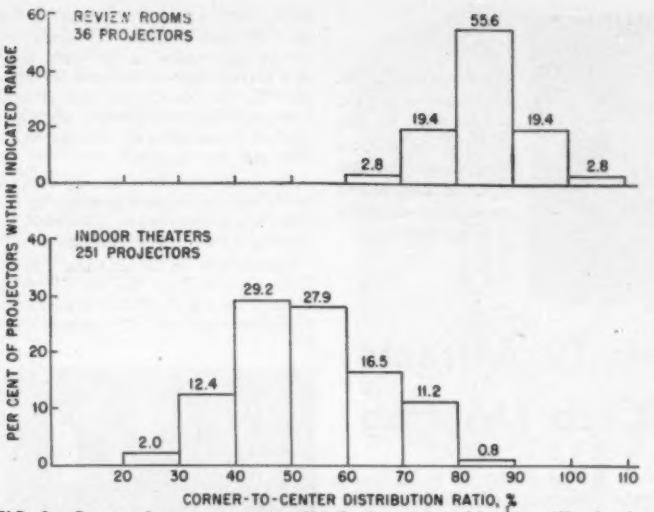


FIG. 8. Range of corner-to-center distribution ratios of incident illumination obtained in the survey.

portion of theaters below the recommended minimum brightness. Other factors studied, such as side and corner screen distribution ratio, cover approximately the same ranges as observed in the earlier survey. The screen reflectivities extend over a much wider range, including both some exceptionally low values and also a number of "silver" screens of extremely high reflectivity.

It is expected that the results of this survey will assist in the formulation of an eventual Committee recommendation for improvement of projection practice in theaters. In the meantime, however, it is believed that better attention to details of operation and maintenance can reduce the wide range of screen brightness observed and eliminate many of the extreme values. It can also eliminate many of the highly nonuniform distributions of illumination over the screen and thereby remove some of the objectionable conditions prevalent.

The findings of this survey in the West Coast review rooms are being considered by the Research Council and West Coast studios in relation to their program of improving review-room practices.

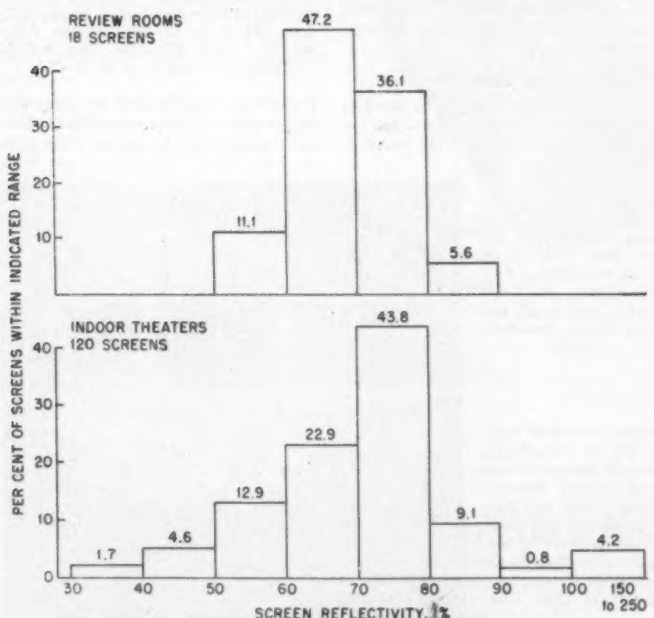


FIG. 9. Range of screen reflectivities obtained in the survey.

Projectionists' Fine Cooperation

The Screen Brightness Committee are indebted to many people for assistance in the conduction of this survey. Theater projectionists and their organization, the IATSE, have been most cooperative in making their facilities and assistance available to us.

The Research Council took the initiative in obtaining the data on the West Coast review rooms. Without the fine cooperation of these individuals and groups, this survey would have been difficult if not impossible.

Par's New Sound Track Position

A change in the present proposed standards for placement of the sound track on 35-mm film has been urged by Loren L. Ryder, sound director of Paramount Pictures. In a report to the SMPTE, Ryder suggested that the magnetic sound track be placed 131 mils (131/1000th of an inch) from the sprocket hole of the film instead of the present 50 mils. This suggestion, he said, is based on extensive studies made of both methods, with results showing that interference from sprocket holes is encountered in the 50 to 100 mil area.

In the ensuing discussion, representatives of three companies presented data tending to refute the Paramount studies.

SMPTE Proposals Pending

The proposed standards of 35-mm sound track placement have been adopted by the M. P. Research Council. The SMPTE sound committee has been studying standards for three years and last July published the proposed standards for further study by members. Action by the sound committee is still to be taken prior to submitting final proposed standards to the ASA.

During the discussion, Ryder stated flatly that Paramount will continue to record sound tracks at 131 mils.

Another Theater Tv Circuit

Latest Eastern circuit to announce plans for theater Tv purchases is Walter Reade Theaters, operating throughout New Jersey. Ten houses in this group will be so equipped as soon as adequate line facilities are made available, probably by the end of this year.

Blair Foulds and Dr. F. N. Gillette (left) of GPL, and Ed Daugherty (L. 384, Hudson County, N. J.), and Harry Mackler (L. 306, N. Y. City), vice-president and president, respectively of the 25-30 Club.

GPL-NTS Theater Tv Attracts 400 to 25-30 Club Meeting

MORE than 400 projectionists in the Metropolitan New York area were given a great show at the November meeting of the 25-30 Club in the Hotel Belvedere ballroom when General Precision Laboratory and National Theater Supply Co. joined forces to stage a lecture-demonstration of the GPL theater Tv direct-projection and intermediate-film systems.

Top technical and executive talent from both companies combined to make this a memorable evening in the history of manufacturer-distributor-projectionist relations.

Physical limitations of the meeting place, no less than safety factors, prevented the installation of the direct-projection equipment, as every projectionist will understand, but this system was described in detail orally with the aid of a fine series of slides. The intermediate system featured a film that was taken off the air, developed and projected *via* the GPL 56-second transition method from air-pickup to screen projection.

Discussion Session Spirited

Following the lecture-demonstration was a lively question-and-answer period which covered many phases of installation and operation. Happily, there was no abrupt termination of the discussion period, as so often happens at such meetings: the session was not ended until there were no more questions forthcoming.

The meeting reflected great credit on the GPL-NTS companies and on their staffs who made arrangements for and carried out the program. Our own Johnnie McGinley, staff projectionist for GPL (Local 650, Westchester, N. Y.) did a fine all-around job.

It is expected that GPL-NTS will sponsor similar meetings in various sections throughout the U. S., an intent which prompts a few observations which may contribute in some small measure to the success of similar demonstrations in the future.

At such gatherings it is a natural tendency for projectionists to engage in considerable fraternizing, particularly when they hail from a wide geographical area and have few opportunities to get together and exchange news and views. This is all to the good, but such socializing by even a very small minority detracts no little from the value of the meeting for the large majority—say, 95%—of those who come to be informed about that which is of vital importance to their work.

Instruction, Not 'Sales,' the Aim

Topmost in mind should be the fact that such lecture-demonstrations are not "sales" meetings in even the remotest sense; they represent an effort on the part of manufacturers to convey important information to the craft, those who operate their equipments day after day. Not infrequently the cost of such demonstrations in man-hours, effort and expense is considerable, running sometimes into four figures.

The craft can show its appreciation to the sponsor of such meetings by inviting the five-percenters to do their socializing outside the meeting area.

Getting back on the mainline, it needs to be set down here that the GPL-NTS Tv show for the 25-30 Club is merely an extension of the policy of extremely close projectionist ties, marked by many distinct contributions to craft welfare, which has characterized the course of the Gen-

TOP PHOTO: From Westchester County, N. Y. (l. to r.)—Joe Monaco, bus. rep. of Local 366; and from Local 650: Irving Weiss, pres., Fred Thome, bus. rep., and Anthony Dente, vice-pres.

BOTTOM PHOTO: From Hudson County, N. Y., Local 384 (l. to r.)—Frank Maurus, Frank Mandrake, pres.; Albert De Titta, and Ed Daugherty, vice-pres. of 25-30 Club.

From Local 306: Ernie Lang, sec.; Herman Boritz, exec. board; Harry Storin, vice-pres.; Dick Cancellare and Dave Garden, exec. board, and Dave Narcey, retirement board.

●

Extreme left: Ernie Lang, L. 306; Ed Daugherty, Allen G. Smith, NTS New York branch manager; Harry Mackler, John Sims, GPL; Ben Stern, treas., and Morris Klapholtz, sec. of the 25-30 Club. Kneeling: Julies Wetzler, sgt.-at-arms of 25-30 Club.

eral Precision Equipment group in every section of the country down through the years.

It was a well-nigh impossible task to obtain, or to list here, all those who attended the GPL-NTS demonstration (and for this IP asks the indulgence of those not mentioned here), but among those noted were:

From GPL: Blair Foulds, John Sims, F. N. Gillette, T. P. Dewhirst, Bill Borborg, and Al Mayer. From NTS: Allen G. Smith, N. Y. branch manager; John Krulish, Bill Nafash, Sam Selden. From INTERNATIONAL PROJECTOR CORP.: Admiral R. B. Tomkins (Ret.), president; Arthur E. Meyer, vice-president, and Bill Hecht.

Also, Dave Joy and Paul Reis, National Carbon Co.; Bob Goldblatt, first president of Local 306 and a founder of the 25-30 Club; a large delegation from Westchester County, N. Y., Local 650, including Irving Weiss, president; Anthony Dente, vice-president, Fred Thome, business agent, and Larry Sabatino; Joe Monaco, business agent of Westchester Local 366; Joe Engel and Al Sweeney, Long Island, N. Y., Local 640; Roy Fisher (Ethyloid cement), Local 253, Rochester, N. Y., and among the many others those pictured in this story.

Show Filmless Camera on Coast

Demonstration on the West Coast of a pilot model of a television camera capable of recording images on magnetic tape rather than on film is expected to spur research work on such a project now underway in several major laboratories.

Device demonstrated in Hollywood utilizes ordinary sound-recording plastic tape. The images, recorded from a Tv show, were reportedly blurred and indistinct, but sponsors assert that they are far enough along with their research to eliminate this defect. Sponsor, incidentally, is the electronic division of Bing Crosby Enterprises.

The recorder does not actually take a picture but records Tv images and sound on tape, from which programs are played back on a Tv receiver. Mass production is slated to begin within eight months.

Theater Tv Hearings on Feb. 25

Hearings on theater Tv, scheduled to start Nov. 26 before the Federal Communications Commission, have been postponed until Feb. 25, 1952. The time for filing in the proceeding also was extended from Oct. 26 to Jan. 25. Allocations of frequencies for theatre Tv and the adoption of rules and regulations for the proposed service will be the topics at the hearings.

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PHOTOGRAPHIC OPTICS

(*Continued from page* 15)

lows extension double normal—our lens will be working at an effective relative aperture of twice that marked on the lens. We would then have to quadruple our exposure time. In fact, the effective relative aperture is given by the product of the stop number for infinity and the magnification plus one.

Fixing Pictorial Perspective

The nodal points, as defined previously, are points associated with a lens having the interesting property that a ray of light directed at one will emerge from the other undeviated. Expressed differently, a ray of light striking the first nodal point will leave the second parallel

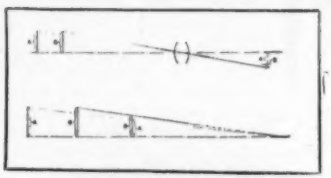


FIG. 25. Perspective I.

to its original direction, and a fan of rays entering the first nodal point will likewise constitute a fan of rays leaving the second. In this manner all the rays forming an image on the film can be considered as having passed through two points of the lens.

The first nodal point constitutes the single eye of the lens, which sees the scene in a certain manner. If a frame were to be held before the first nodal point, the objects in the scene would be in certain relationships to each other, determined, among other things, by the size of the frame and its distance from the nodal point. These relationships we summarize as *perspective.*

If this frame is the conjugate of the borders of the negative, our pictorial perspective is then fixed, and if we wish to see the scene as the camera saw it, we must place our eye in the position occupied by the second nodal point. Only then could we speak of having the correct perspective (Fig. 25).

Human Eye Characteristics

Very few people can accommodate at distances less than 10 inches, which is taken as the shortest reading distance,

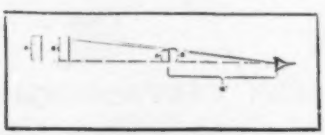


FIG. 26. Perspective II.

or near point. Most camera lenses have focal lengths less than this, so contact prints inevitably yield a certain perspective distortion, unless the lens used had an equivalent focal length of 10 inches or more. One way of getting the eye in the proper position to recover the true perspective is by enlarging our negatives. In accordance with these considerations the rule is to enlarge so that the effective focal length is equal to the anticipated eye-to-print distance.

For instance, if a 2-inch lens were used to make the miniature negative, and hand-held prints were desired, to be viewed at about 14 inches, we would want the perspective of a 14-inch lens. We could get this by enlarging our negative 7 times. We could achieve the same thing by viewing our miniature transparencies at 7 times magnification. If higher magnification is employed in enlarging, the position accordingly moves outward (Fig. 26).

[TO BE CONTINUED]

Vallen Needed—and Got—a Pro

Ingenuity, no less than the versatile manner in which engineered component units may be employed, are reflected in a recent installation of a curtain control by Vallen, Inc., Akron, Ohio. The job was a challenge to the accumulated experience of show-business people, which meant that its execution was accomplished strictly on the basis of know-how supplemented by the doing-it which can only stem from action *on the scene.*

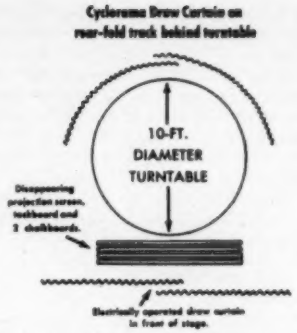
One of the major requirements in the new Children's Cancer Research Foundation in Boston—the first and only building of its kind in the world—was a surgical amphitheatre where cancer operations could be conducted before doctors, nurses and technicians. To be of maximum use, the amphitheatre had to incorporate a revolving stage, chalkboards and projection screens for lecture use; yet, it had also to provide complete privacy on the stage when desired or necessary. This was no easy problem.

How the Job Was Done

A 10-foot diameter turntable installation that permits revolving stage through a full 360° circle, insuring full unobstructed vision for all observers.

Two chalkboards, one tackboard, and a projection screen provide ample facilities for lecture notes and diagrams in full view of the auditors. Each board is independently operated by a Vallen, Jr., curtain control, permitting raising or lowering the boards quickly, smoothly and dependably in any sequence.

The cyclorama curtain is hung on Vallen curved curtain track (No. 153) which incorporates the exclusive Vallen rear-fold feature, and follows the contour of the stage. The front curtain hangs on


Cyclorama Draw Curtain on rear-fold track behind turntable
10-FT. DIAMETER TURNTABLE
Disappearing projection screen, tackboard and 2 chalkboards.
Electrically operated draw curtain in front of stage.

Details of unique Vallen installation.

Vallen all-steel, noiseless safety track (No. 150) and can be opened or closed effortlessly by means of a Vallen Curtain control. Thus the entire stage area can be closed off when necessary.

Naturally, one of our boys—Joe Cifre of Boston Local 182—handled the job.

Electronic Vocational Guide

TV AND ELECTRONICS AS A CAREER is the title of a new book just published by John F. Rider, Inc., 480 Canal St., New York 13, N. Y. Engineering, broadcasting, manufacturing, servicing, parts and receiver distributing, sales representation, retailing, and electronics in the armed forces are discussed by top authorities, who wrote on their special fields. Also, there are included appendices on pay scales for broadcast personnel and Tv service branch personnel, electrical engineering curriculum, and educational institutes in the U. S. teaching radio, television, and electronics.

All the why's and wherefore's of the electronics industry are explained for the newcomer embarking on a career, and the electronics "oltimer" desiring to switch to another field of specialization within the industry. Written in an easy-to-read style, the book contains 325 pages with 136 illustrations in a cloth binding. Price: $4.95.

Christmas Seal Campaign Opens

Xmas Seals have helped many people in show business—and show business never fails to remember its friends.

Support for the research and other work of the voluntary tuberculosis associations is derived from the people through their purchase of Christmas Seals. Each year, at the Christmas Season, the local tuberculosis associations conduct the sale of Christmas Seals by mail. Sheets of Christmas Seals are mailed to residents of the community, who make their returns by mail. Personal solicitation, either at business or at home, is therefore avoided.

Christmas Seals have become a holiday tradition in this country, where they have

been sold since 1907. The first sale was in Wilmington, Del., and was sponsored by the late Emily P. Bissell to raise funds to help some doctors continue their treatment of a small group of needy patients. The doctors needed $300. Through the sale of Christmas Seals, Miss Bissell raised $3,000 for their work. The sale of Christmas Seals had been inaugurated in Denmark in 1904, the idea of a postal employee named Einar Holboell.

Local Communities Retain 94%

Each year 94% of the money raised by the sale of Christmas Seals remains in the state where it was contributed to support local and state tuberculosis control programs. The remaining six per cent is forwarded to the National Tuberculosis Association. At least one-sixth of this percentage is used for medical and social research.

Each year a different design is used for the Christmas Seal. This year a jolly Santa Claus smiles from the Christmas Seal. Whatever the design of the Christmas Seal, it always bears the Double-Barred Cross, registered emblem of the National Tuberculosis Association and its 3,000 affiliates. An adaptation of the Cross of Lorraine, the Double-Barred Cross is also the emblem of the world-wide crusade against tuberculosis.

NEWS PROJECTIONS

RADIO-TV manufacturers deny creation of a "war chest" to buck theater Tv. Assert that both enterprises can "live together." Oh, yeah? . . . N. Y. State highest court has confirmed ban on Italian import film "The Miracle." Appeal will be made to U. S. Supreme Court. . . . Roy Rogers won court action to bar Republic Pic from peddling his films to Tv nets. Decision not universally applicable, because of special clauses in Rogers contract. Gene Autry proceeding likewise. . . . First nine months of 1951 saw 93 new enclosed theaters and 185 drive-ins opened. . . . Universal, Monogram, Paramount and Republic now making pics for Tv nets. Won't be long now. . . . Skouras Theaters (N. Y.) flat $1 admission for an entire family regardless of size (plus individual tax) deemed a great success and will be a fixed Friday night policy. Largest family to show up numbered 11. . . . Decca Records now controls Universal Pictures, thus giving a double-barrelled entree into radio-Tv—transcriptions and pics. . . .

\- - -

Before they even get off first base on regular theater Tv, exhibitors are mulling plans for educational and industrial Tv—morning shows, etc. . . .Half of 20th Century-Fox features for 1952 release will be in Technicolor. . . . Six weeks of special children's Saturday matinee shows for $1 has been set by Balaban & Katz Norton Theater in Chicago, Parent and teacher groups cooperating. . . . Drake Hotel, Chicago, the scene for next SMPTE convention, April 21-25 next. . . . NPA has sent out 20,000 letters to theaters anent carbon copper salvage. . . . NPA says that military use of raw film stock will be held to a point at which civilian requirements will not be strained. . . . Fight at a Baltimore, Md., arena on Nov. 2, a 10-rounder, with a supporting card, took in $498 at the gate. Event was televised by CBS coast-to-coast. Savvy? . . . Those who yelled lustily that installment buying was a major cause of the box-office decline had red faces when both cuffo buying and b. o. take increased during Sept. . . . Bank night drawings for cash prizes will not be subject to the new "gamblers'" tax, BIR ruled. . . . Wall St. sees movie attendance up from 6 to 8% over the past two months.

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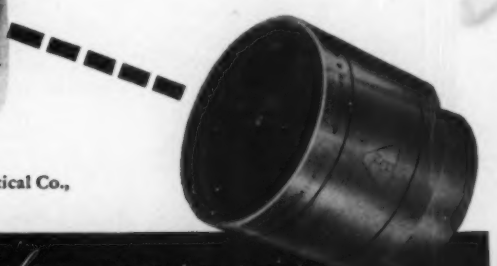

Write for complete information to Bausch & Lomb Optical Co., 616-11 St. Paul Street, Rochester 2, N. Y.

Bausch & Lomb *Super Cinephor* Projection Lenses

PROJECTIONIST SHOWMANSHIP

(*Continued from page* 14)

Running down film to check the threading should be done by means of the handwheel. This may be the soundhead flywheel on certain machines, the motor flywheel on certain others, and a motor drive gear on still others. The shutter and the intermittent flywheel should *never* be used for "turning over" a projector! Nor should the motor be switched on and off rapidly. Why? Because:

1. Any slack film in upper and lower magazines may suffer perforation damage because the motor starts the sprockets turning rather suddenly.
2. Serious burning of the switch contacts occurs whenever the motor is turned off before it has attained normal running speed. (The starting windings of an A.C. motor consume much more current—many times more amperes—than the running windings. This current is so great that it exceeds the capacity of the switch momentarily.)
3. Switching the motor on again before it has entirely stopped turning inflicts a terrific strain on the projector gears, weakening the teeth or even stripping them. The main drive gear and the fiber spiral shutter gear of a popular make of projector head take the most punishment when this practice is indulged in. (Why does turning the motor on before it has completely stopped strain the gears? The powerful starting torque of the motor is *added* to the momentum of the already revolving gears.)

These are three very cogent reasons why the motor should *never* be used for running down film as a threading check. The handwheel should always be used. So much for that.

Sprocket Idler Adjustment

Now, then, damage to film perforations may also be minimized by seeing to it that all sprocket idlers are adjusted so that, when closed, the face of each idler is at a distance from the face of the sprocket equal to 2 thicknesses of safety film. Also, each idler should be properly centered laterally so that it does not shear one edge of the film. Roughened places on the edges of leaders indicate that badly centered idlers have taken a hunk out of them in somebody's theater.

With the equipment and prints in shipshape condition, with both projectors laced up with the first two reels of the show, and with both arclamps trimmed with carbons of adequate length, the show is ready to go on. In most theaters the projectionist's showmanship begins the very moment patrons enter the auditorium. Footlights are switched on to illuminate the "grand drape" colorfully and pleasingly; and mood music begins to issue from the curtained stage.

Overture Intermission Music

The matter of overture and intermission music warrants much more attention than it usually receives in small and medium-sized theaters. This writer has heard a circuit district manager (not now in the business, as you can well imagine) brush off pre-show music as an unimportant superfluity. And the writer knows that most circuit house managers are unfortunately too busied with a mass of trivia or too terrified by "economy" blasts to maintain a fresh and copious supply of new phonograph records of suitable types. Actually, the establishment of a "theater atmosphere" before the show by means of music is a mighty important aspect of the problem of keeping theater business alive.

Every projectionist, like anyone else, has his personal preferences in music. But the true showman keeps in mind the fact that a specific type of patron is attracted, as a rule, to a specific type of feature film. Persons who attend the theater to enjoy historical dramas and sophisticated drawing-room comedies are usually not the same people who crowd the theater to have a good time watching westerns, exciting action melodramas, and war films. There are children's pictures, women's pictures, and men's pictures. Slapstick comedies are enjoyed principally by persons of very low and very high intelligence; while in-between people derive the most enjoyment from light drama and "family-type" films.

Knowing all this, the projectionist finds it a simple matter to choose the right kind of overture and intermission music for each and every type of film program. He will therefore not use hillbilly songs to establish the atmosphere for a Bette Davis film, and he will not

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play Katchaturian's suites as a prelude to a Roy Rogers opus. The latter requires Western music; the former emotional, or dramatic, music.

Non-Sync Reproduction

It is always a good idea to listen to the non-sync reproduction from the auditorium once in a while as a check on sound quality. Poor frequency response —too "boomy" or too shrill and "scratchy"—may be remedied by correct impedance matching of the phonograph pickup to the first stage of amplification.

Phonograph needles — even those which are guaranteed to be "permanent" —must be renewed from time to time. And crystal pickup cartridges require replacement when they get weak and sound "thin" or "mushy." Excessive heat utterly ruins a crystal pickup; but even if properly cared for they seldom last longer than 4 or 5 years. Only the superior condenser-type pickup lasts practically forever; but these pickups require a special hookup and a pre-amplifier, like a condenser microphone or a photoelectric cell. Magnetic pickups are passé and rough on records because they are so heavy.

[TO BE CONTINUED]

FILM RESEARCH COUNCIL

(*Continued from page* 12)

of obtaining a directional screen which will permit of camera movement and yet offer a light gain of four or five times that presently available with the nondirectional screens.

Traveling matte composite photography presents many difficult problems. Presently, it is used in the industry only where there is no other way of making the required picture. This is true because the process is slow, expensive and it is difficult for many people to understand and appreciate the results which can be obtained.

The Research Council, in undertaking an investigation of this process, expects, therefore, to work toward a system which will overcome all three of these objections. It is hoped to develop a system which will be fast and inexpensive and will permit the director, cameraman and others concerned to see the composite result at the time the foreground is being photographed. This, of course, can be true only if the background material is already available on a motion picture film. That's a rather ambitious undertaking because it involves problems of optics, photographic materials, lighting and electronics. Preliminary studies, however, lead to the belief that these highly desirable results can be achieved

The expected improvements in this rather old form of composite photography appear possible because of improvements which have been made in photographic film base, emulsions and electronic developments.

Projected Still Backgrounds

The use of projected still backgrounds has long been quite a problem, particularly where color is involved, much of the difficulty arising from the instability of the colors under the high temperature and ultraviolet light conditions which prevail. A further difficulty has been the problem of matching the foreground and background colors, since the foreground is an original and the background is a dupe.

These difficulties were demonstrated with a frame of a 35-mm color print [which accompanied this paper but cannot be reproduced in color herein] in which the lower left-hand quadrant is a direct photograph of a color chart, and the other three quadrants are occupied by projected reproductions of the same color chart. Two of these are still projections and the third is a motion picture projection.

While none of these match the original,

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it is noted that the difficulty is principally in the red end of the spectrum. This is indeed fortunate since still background scenes rarely contain any significant red. Colors in such scenes are predominantly blue and green, where the comparison is not so odious. Nevertheless, this is not a satisfactory situation and it is hoped that new color films which will shortly be on the market will correct or at least improve this situation.

Although a picture is photographed on a two-dimensional medium (the film itself) and projected on another two-dimensional medium (the theater screen), the industry has always wanted a picture in three dimensions.

Three-Dimensional Films

There have been a number of papers presented with demonstrations of systems which permit of all three dimensions. Some of these have employed polarized light and others have obtained their separation by color, and similar procedures, but in every case they require the use of some kind of crutch by each individual in the audience, or they restrict the viewer's position and motion of his head in a most unnatural way. So far the industry has been unwilling to make any commercial use of any of these systems, except on a novelty basis.

The Research Council is constantly receiving proposals from inventors all over the world for systems to permit three-dimensional motion pictures. So far none of these systems appears practical. Nevertheless, each one is carefully considered and investigated if that seems necessary.

The Research Council activity in connection with color is largely confined to reporting to our member companies on various color systems as they are announced and studying problems of test and control for color systems which seem likely to receive commercial usage. We are consequently interested in color densitometers, color charts, printing machines and similar devices.

In the field of magnetic recording and in the older art of photographic recording, the Research Council has not been particularly active because both the studios and their suppliers are actively at work on these problems. An analysis of the economic problems which needed consideration in connection with magnetic recording was prepared, however, because the differences in operating practices and requirements throughout the industry were creating false impressions which needed correction.

Television Developments

Television presents another situation where the Research Council can only hope to keep abreast of that fast-changing art so that its member companies may be advised when television systems, equipment or techniques reach the place where they can be profitably applied to the production of motion pictures. In other words, the Council is not concerned with television as a medium of home

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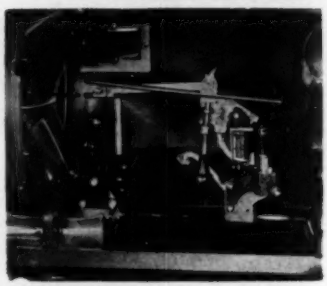

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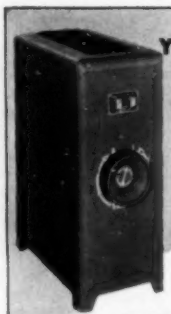

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entertainment. It is concerned with it as a medium of theater entertainment and as a means of producing motion pictures.

There is oftentimes some confusion regarding the relationship of the Motion Picture Research Council to the Society of Motion Picture and Television Engineers. This misunderstanding usually arises from matters having to do with either standards activities or test films.

The Research Council works very closely with the Society on all problems of standardization within the motion picture industry, but as a member body of the American Standards Association the Research Council also acts directly on such problems. The Society and the Research Council work very closely together in the test-film field, each accepting orders for test films made by the other. Test films are looked upon as a service to the exhibition end of the industry which has been undertaken to insure satisfactory presentation of the studio product in the theater.

THE ELUSIVE SCREEN LUMEN

(*Continued from page 8*)

to raise the visible ray transmission to the screen) to equal that of a silvered glass reflector at 70-amperes (16,000 total screen lumens). By so doing we will have also increased the heat ray (infrared) transmission by 20% above that of a 70-ampere arc using a silvered glass reflector, thereby raising the light heat far above the safe heat level that film can stand.

Film Damage, Higher Cost

The net result of the foregoing hypothetical case is that though we have not increased the total amount of visible light (16,000 total screen lumens) that a glass reflector can produce at 70-amperes, we have, in addition to making film heat damage inevitable, increased the 70-ampere current and carbon operating costs about 50%.

Thus, it is perfectly clear that without some means of light-heat protection being afforded to the film, the mere use of a certain type or size of carbon combination, having a claimed high maximum screen lumen output, at a certain amperage, in a lamp having a particular diameter reflector and certain high *F* light beam speed, is absolutely no guarantee that a higher level than 16,000 total visible screen lumens will be obtained therefrom, because were it actually possible, film damage would positively follow.

We feel strongly that a sales organization or manufacturer who claims or intentionally creates the impression that levels of screen illumination of from 18,000 to 26,000 total screen lumens are possible, and at the same time intentionally avoids mentioning any light reductions because of the absolute need of light-heat protection for the film, or who gives the wholly erroneous impression that such supplementary protective means are not necessary, should be forced to prove his contention.

Such proof might take the form of (1) a guarantee that such high total screen lumens could and would be continuously maintained, and (2) guarantee payment to the purchaser for all film damaged by such an operation.

Comparative Summary of Systems

HEAT-ABSORPTION GLASS: Original cost is exceedingly low as compared with any other. No high installation cost. Upkeep

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and operational cost is practically nothing by comparison with other systems. It offers a selective cooling feature which permits only the required degree of cooling as is needed to prevent heat damage to the film. Positively and definitely effective.

HEAT-REFLECTION (DICHROIC): At the present not as efficient and not sufficiently developed for a fair comparison with other systems.

MECHANISM WATER-COOLING: Completely ineffective as a means to reduce the thermal impact (light heat) of the light striking the film.

HIGH-VELOCITY APERTURE AIR JET: As presently applied to regulation projection service, it can not be expected to function as a definite method of affording absolute light-heat protection to the film.

An elementary example conclusively illustrating the ineffectiveness of air-stream systems to reduce the thermal impact of the light upon the film is the fact that, though the winter sun's rays pass through untold miles of sub-zero space and winds, yet when they are stopped here on earth, they still contain their proportionate amount of thermal content (heat) and radiant energy (visible light).

This proves a basic tenet of physics, that the mere passing of a high-velocity air stream through any beam of light will in no way alter the originally generated proportions of its thermal energy (heat) to its visible radiant energy (light). Hence, such systems can only be expected to dissipate accumulated heat *after* it has been absorbed and built up in the film.

It is difficult, therefore, to justify its high initial cost, high installation cost, high operational and maintenance expense as compared with that of the heat-absorbing glass system.

Where Do We Go From Here?

As has been clearly shown, our industry now has projector arclamps—8-mm copper-coated carbons at 70 amperes—which produce all of the light that film can stand (up to 16,000 total screen lumens) without the use of heat-filtering devices. Also, we have lamps—13-mm carbons at 180 amperes—that produce a sufficiently higher volume of light (to 26,000 total screen lumens) so that a major increase in screen illumination is possible *with* heat-filtering devices.

Of the utmost pertinency at this point is the fact that due to the mechanics of present-day projectors, their optics and accepted projection practice, only from 20 to 35% of the total visible light produced by any type of 35-mm arclamp ever reaches the screen. The normal light waste, therefore, is inversely from 186 to 400%.

It's an astounding fact, but we waste from three to four times more light than we actually use for projection to the screen!

Thus, we already have one lamp producing all the light (heat) that film can tolerate, and another that produces almost 100% more light (heat) than film can tolerate, and we have the situation of a tremendous light loss as a result of projector construction and projection practice. In the face of these facts, it is pertinent to ask just where the so-called intermediate type of lamps—9-mm carbons at 85 amperes—fit into the picture. What advantage do they offer except high first cost and continuing higher operational and maintenance cost?

New Carbons, Lamps No Answer

Just how can new carbon combinations, requiring higher amperage, voltage and new lamps, be expected to provide higher screen illumination if they do not exceed by a worthwhile margin the high levels of total light that we now can produce?

It seems to us that the logical solution to the problem of obtaining higher screen illumination levels lies primarily in salvaging some of the vast amount of light we now waste, through the adoption of more efficient optics, revolving shutter arrangements and intermittents. After all, it makes small difference if in ruining film we do it by warping and blistering it by heat or by accelerating the rate of sprocket hole wear.

Another question: *who* should determine just how much more visible light and light-heat can be tolerated by nitrate, acetate or any other type of film stock?

Where do we go from here for higher screen illumination? Well, in the face of all the aforementioned facts, we are certain that the answer will not be found in new carbon combinations requiring new lamps and new power supply units. This course will only result in higher initial and operating costs for the exhibitor, and for the manufacturer the extra burden of tooling for and producing such equipment.

It's all right to dream, but we have to wake up before we can make our dreams come true.

New Film Prints From Old

Making new prints from shrunken, older motion picture films will be less of a problem through use of a new variable-pitch sprocket developed by Kodak. J. G. Streiffert, Kodak scientist, reported on the new sprocket at the recent SMPTE convention.

The device has a unique sprocket tooth whose driving face is a plane lying on a radius of the sprocket. This is used to improve longitudinal registration of the film over that obtained with conventionally-shaped, curved-profile teeth. The sprocket, with a supporting drum, accommodates shrinkage through varying pitch. Streiffert reported that flutter in sound prints and steadiness in picture prints made on a sprocket of this type in a 16-mm printer were found to be substantially independent of film shrinkage and markedly better than in prints made on conventional printers.

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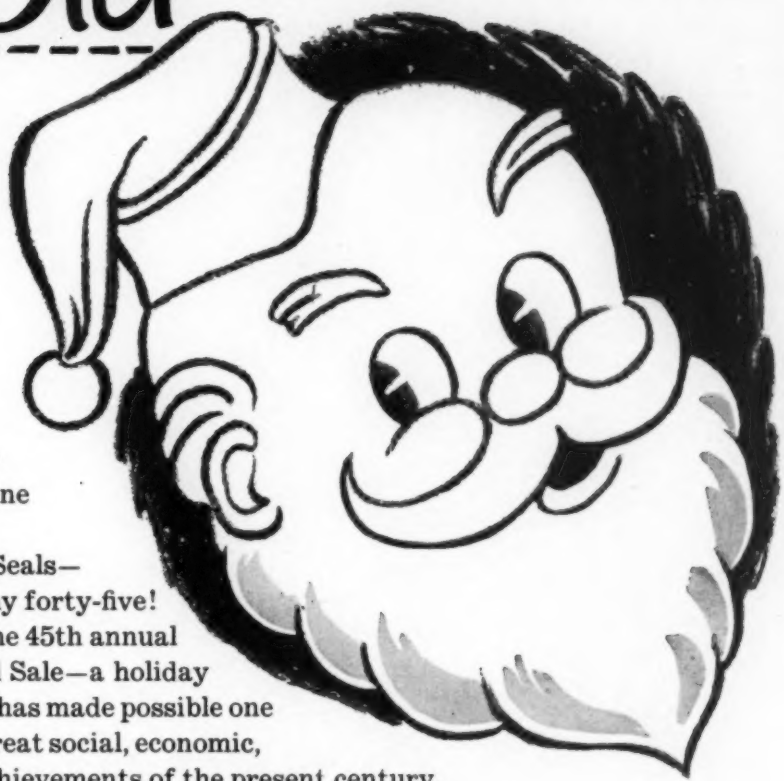

This particular Santa—the one you see on the Christmas Seals—is a very healthy forty-five!

Yes, this is the 45th annual Christmas Seal Sale—a holiday custom that has made possible one of the great social, economic, and medical achievements of the present century.

Your purchase of Christmas Seals has helped save 5,000,000 lives. Yet, tuberculosis kills more people than all other infectious diseases combined.

So, please answer once again the call that comes but once a year—and help make possible the campaign against tuberculosis every day of the year.

Buy Christmas Seals!

Because of the importance of the above message, this space has been contributed by

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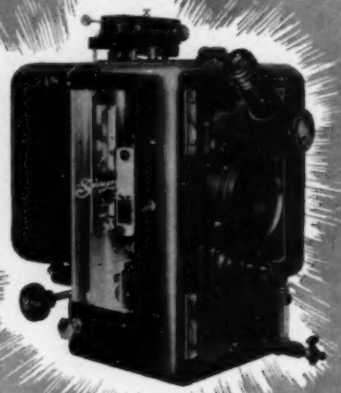

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- Forty years of constant development and improvement.
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